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INVERTEBRATE CONSERVATION NEWS

No. 63, October 2010

EDITORIAL

The world's nations have reportedly failed to meet the international target for slowing the loss of biodiversity by 2010; not much of a surprise, considering all that we hear about the unrelenting destruction and degradation of ecosystems. Targets in many aspects of life have been getting a bad press in recent years, since they often encourage superficiality or a neglect of other things. Also, they are often set either too high or too low. The mere existence of targets for the conservation of biodiversity is, however, a minor achievement in itself, considering that the main motivations of most politicians lie elsewhere.

As judged by past and current performance, we human beings are very far from achieving a mode of existence that could ensure our own long-term survival, let alone that of most of our fellow-species. The tendency is to pursue 'business as usual' until a problem becomes critical. It then becomes economically or politically expedient to seek solutions to the problem, but the solutions themselves can create new problems. In the case of food shortages, the solution might be to intensify agriculture or to bring 'marginal' land into cultivation. In either case, there will very often be negative consequences for wildlife, especially the less glamorous kinds.

Technical solutions and changes in lifestyle might ease some of the existing problems of resource-depletion and pollution, but not enough to overcome the adverse effects of uncontrolled growth in the human population. Since the adverse effects include the accelerating destruction and degradation of the habitats of an immense number of invertebrate species, it seems fitting in this edition of *ICN* to publish a letter from a reader who takes the view that there are already far too many people on this planet. He does so from the perspective of having been born when the world population was about 1.7 billion.

NEWS, VIEWS AND GENERAL INFORMATION

Brownfield conservation: an international perspective

The importance of brownfield habitats is now quite widely recognised in the UK, where they often represent 'oases' amidst a species-poor 'desert' of high-density urbanisation or intensive agriculture. Regrettably, however, politicians and planners mostly still seem to believe that brownfields should be valued only for their potential to be re-developed for housing or commercial use. Their ignorance or prejudice is challenged only rarely, perhaps because it is shared by most of the journalists who are in a position to ask questions. Meanwhile, the biodiversity interest will have to shout loudly in the hope of redressing the prevailing imbalance.

In the USA, where brownfield land was apparently first named as such (in the early 1990s), it appears to be regarded in a more negative light than in the UK. A search of American websites shows a lot of information about brownfields, but it is nearly all concerned with their reclamation for new industry, housing, agriculture or (in some cases) conventionally designed green urban space. Perhaps this is to be expected in a country where the land area is much greater and where a greater distinction is made between areas set aside for conservation and commercially utilised or residential land.

At the 2004 Symposium of the Society for Conservation Biology, Westphal *et al.* (2005) set out a consultative framework for evaluating brownfield sites in various respects, including biodiversity. Their study area was the Calumet region of north-west Indiana and north-east Illinois, which became the world's largest area of heavy industry by the end of World War II. The study focussed particularly on an area, known as Indian Ridge Marsh, which has been taken into public ownership with plans for ecological rehabilitation. The biological aspects of the study involved vertebrates and plants, rather than invertebrates, but it is encouraging that the authors have identified a process whereby American brownfield habitats could be conserved.

In various countries of continental Europe (e.g. the Czech Republic; see *ICN* No.57), a number of studies of the fauna and flora of brownfield sites have been undertaken. Czech studies have shown that 10% of a total of 692 invertebrate species recorded in old quarries are on the national Red List. Somewhat more (14%) were in the category of having specialised habitat requirements. The Czech studies have indicated also that naturally restored mining sites provide greater

biodiversity benefits than those that are technically restored by the application of topsoil and a seed-mix (Tropek *et al.*, 2010). There are huge lignite quarries in the Czech Republic, but none of them is reserved for natural restoration.

In Europe generally, there is relatively little information to suggest that brownfield habitats are being considered for protection. A research group has, however, developed a computer-aided method that takes account of various economic and societal aspirations regarding brownfield sites. With support from the European Commission under the Fifth Framework Programme, the research group identified a range of aspirations by interviewing "stakeholders", including local authorities and property owners, in a study area in south-west Germany. The responses concerned such matters as groundwater contamination, the hindrance of urban development and the lack of green spaces close to dwellings. If green spaces can be equated with the opportunity to allow wildlife to thrive in places where it can be seen by people, this structured approach might offer a ray of hope.

References

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Bleicher, A. & Gross, M. (2010). Sustainability assessment and the revitalization of contaminated sites: operationalizing sustainable development for local problems. *International Journal of Sustainable Development & World Ecology.* **17**(1), 57-66.

Tropek, R., Kadlec, T. and Karesova, P. (2010). Spontaneous succession in limestone quarries as an effective restoration tool for endangered arthropods and plants. *Journal of Applied Ecology* **47**, 139-147.

Final ban of cypermethrin in UK

Buglife – the Invertebrate Conservation Trust has welcomed a decision last March by the UK Government to withdraw all relevant product permissions for the use of the insecticide cypermethrin (see *ICN* Nos. 41, 48 and 50). Buglife states that, owing to the very high toxicity of this synthetic pyrethroid to invertebrates, an estimated annual average of 1.5 billion animals in rivers, streams and ponds were being killed as a result of its use in sheep dips in the UK. Buglife states that, in addition to the contamination of water bodies from sheep dips, an annual average of 400 million litres of waste cypermethrin was being applied to meadows and other fields, causing untold destruction to insects such as butterflies and bees.

The permanent ban follows a campaign led by Buglife and fishing charities, which led in February 2006 to a suspension of the licence to sell synthetic pyrethroids for sheep dips. Buglife reports that subsequent studies revealed that the chemical was even more deadly than had been feared. A single sheep walking through water 9 cm deep two days after having been dipped was found to release enough cypermethrin to cause a pollution event in a stream.

International failure to meet biodiversity targets

A report prepared by the Convention on Biological Diversity (CBD), with financial support from the EU, has confirmed that the world's nations have failed to meet a target, set for 2010, to reduce the rate of biodiversity loss (Anon., 2010). The report is based on an analysis of the fifteen indicators developed by the CBD to monitor losses in biodiversity, together with reviews of scientific literature, recent assessments and national reports from parties to the CBD.

The report emphasises that severe losses in biodiversity, in addition to being of intrinsic concern, adversely affect the livelihoods, health and well-being of people. The adverse effects on people are caused not only by the decline of species of direct economic importance but also by a loss of so-called 'ecosystem services'. Also, the report identifies harmful events and processes that could reach 'tipping points', beyond which widespread extinctions could occur. One of these potential tipping points could result from the dieback of large areas of the Amazon forest as a result of climate change, deforestation and fires. Losses in forest cover result not only in extinctions of species but also in changes in climate, both regional and global.

The eutrophication of freshwater lakes and other inland water bodies, caused by a build-up of nutrients from sources such as agricultural run-off, is another process that could reach a tipping point. This would lead to significant loss of fish and to a reduction in the recreational potential of the water bodies affected.

As far as the marine environment is concerned, the collapse of coral reef ecosystems would threaten the livelihoods of people directly dependent on coral reef resources. Coral reefs are threatened by increasing acidity and temperature of water temperatures, together with over-fishing and nutrient pollution.

One of the report's key recommendations is that all government departments should understand and attach the greatest importance to

biodiversity policy, at international, national and local levels. They should therefore introduce enhanced measures to protect habitats and to guard against the spread of invasive species. Also, they should not treat biodiversity policy in isolation from policies for agriculture, forestry and fisheries, which are currently unsustainable in many instances. As far as climate change is concerned, it is suggested that adaptation and mitigation could be achieved at a relatively low cost if the methods are based on an understanding of ecosystems.

The above summary of the report is adapted from a news item published under the Science for Environment Policy, DG Environment News Alert Service, Issue 200, 17-Jul-2010. This points out that the EU is committed to tackling biodiversity loss. To this end, the Environment Council in March agreed a post-2010 target which seeks to "halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020".

Reference

Anon, (2010). Convention on Biological Diversity report. Global Biodiversity Outlook, 3rd edition: http://gbo3.cbd.int/

Asian longhorn beetle in Britain

As mentioned in *ICN* Nos. 28 and 57, the 'Asian longhorn beetle' *Anoplophora glabripennis* has occasionally been found in the UK, having apparently emerged from imported wooden packing materials. The worry has been that this invasive species could become established in the UK, as has happened in North America and the Lombardia region of Italy. The burrowing activities of the larvae in living trees of various genera, especially maples (*Acer* spp), weaken the trees and create a need to fell them in an attempt to control infestations and, in some cases, to reduce the risk posed by falling branches. Such a situation could be very damaging in the UK if veteran trees and other trees of special conservation value were affected.

Recently reported cases in the UK have involved the emergence of adults of *A. glabripennis* from living trees. In some instances, trees had been imported while harbouring larvae, which take three to four years to develop. The subsequent emergence of adults does not necessarily indicate that the species has become established, but it is important to try to intercept them before they can give rise to a further generation. One of the recent occurrences was at the Langham Church of England Primary School near Oakham, Rutland. There have been findings also

at Haydock in Merseyside, and Hastings in East Sussex. In both the latter instances, the beetles emerged from Japanese maple *Acer palmatum*.

Anyone who discovers *A. glabripennis* in the UK is urged to report it to the authorities (the Forestry Commission or Fera, whose websites include a guide to identification).

SITES AND SPECIES OF INTEREST

Habitat creation for a rare spider, rediscovered in south-east England

The linyphiid spider *Midia midas*, dubbed the Midas tree-weaver, preys on small invertebrates such as springtails in birds' nests, squirrel drays and leaf litter in ancient trees. It is thought to be very rare in Britain, having been recorded only in five localities, but its status is uncertain owing to its small size and its concealed habits.

As an inhabitant of hollow trees, *M. midas* is classed as a saproxylic species. Saproxylic species include those that feed on detritus, fungi or other invertebrates on or in decaying wood, as well as those that feed directly on the wood. For various 'secondary' saproxylic species, suitable habitat could in principle be created outside a hollow tree, as has been done in the case of the very rare Violet click beetle *Limoniscus violaceus* in a famous habitat creation project set up by Ted Green on behalf of English Nature (now Natural England). The beetle colonised not only an artificial habitat (containing sawdust, pigeon droppings and a dead cat) in a hollow tree, but also a store of similar material in a nearby plastic sack (Green, 1995). The project took place in Windsor Forest, west of London and was repeated at Bredon Hill, Worcestershire.

In a similar project set up between Buglife – the Invertebrate Conservation Trust and the British Arachnological Society, Tony Russell-Smith has created artificial nests for *Midia midas*. Each nest, comprising a cluster of twigs, leaf litter and organic chicken manure in a net bag, was placed in a veteran pollard of hornbeam, beech or oak in Epping Forest, Essex during the month of May. According to a report from Buglife, two females were found, both in oak pollards, when the first in a series of sequential batches of the nest material was sampled in June.

The use of artificial nests by endangered invertebrates could help to overcome a lack of continuity of natural habitat, as in the case of *L. violaceus*. The project involving *Midia midas* illustrates an additional use for artificial nests; i.e. as a means of detecting species whose concealed habits make them otherwise difficult to find. The previous UK record of *M. midas* dated back eight years, and so the discovery of this rare spider represents welcome news of its survival in Epping Forest.

Reference

Green, T. (1995). Creating decaying trees. *British Wildlife* 6(5), 310.

Ground beetle *Elaphrus viridis* threatened in California, USA

Like other members of its genus, *Elaphrus viridis,* known as the Delta Ground beetle, inhabits wet ground near water-margins and has a pattern of elytral pits on a metallic background (in this case emerald green), which provides camouflage amongst the reflections of sunlight from the wet surfaces.

The adults and larvae of this carabid beetle prey on other small invertebrates, such as midge larvae (Diptera) and springtails (Collembola), around the margins of vernal pools and patches of water along ditches and the edges of trails and roads. When the pools dry up in summer, the adults bury themselves and then pass into a state of diapause until the next rainy season. The hatchling larvae also burrow into the moist soil but continue to develop until they pupate in autumn and then emerge as adults in winter.

The beetle is now found only in a ten square mile (26 sq. km) area around Jepson Prairie Reserve in central Solano County, in the Central Valley of California. Despite a possibility that there might be some, as yet, undiscovered colonies, the range of the beetle is thought to have declined severely within the valley. Only about 75 individuals have been seen since 1974.

The decline of *E. viridis* is blamed on the widespread disruption and destruction of its wetland habitat, associated with agricultural development, the tapping of vernal pools for irrigation, river canalisation, and the encroachment of urban areas. There is now also an immediate threat in the form of an introduced alien plant, garden lippia (*Phyla* spp.), dense mats of which crowd out native vegetation in vernal pools and hinder the beetle from foraging.

The beetle is classified as Critically Endangered in the USA and is included on the IUCN Red List of 2004. Also, it is protected under US law by the Lacey Act, which prohibits its import, export, transport, sale, purchase, receipt or acquisition. Additionally, it is protected in the wild within the Jepson Prairie Reserve, but there is a continuing need to negotiate protection on nearby private land. Conservation of the seasonal (vernal) pool ecosystem is important not only for the sake of this species, but also for that of the assemblage of other dependent species, many of which are also endangered.

Reference

http://www.arkive.org/delta-green-ground-beetle/elaphrus-viridis/info.html

Search for the click beetle *Anostirus castaneus* in Yorkshire, UK

Buglife – The Invertebrate Conservation Trust has been searching for the Chestnut-coloured click beetle *Anostirus castaneus* at Birk Crag near the Yorkshire town of Harrogate with the aid of volunteers. The beetle, which is a UK Biodiversity Action Plan Priority species and is listed as Endangered in Britain, has previously been recorded on open, often disturbed, ground on free-draining, usually sandy, soils in sheltered, sunny situations. The larvae prey on other invertebrates in the soil and also eat the roots of various plants. Following pupation or hibernation, the adults emerge in warm weather in the following spring.

The click beetle is found widely in central and northern Europe and east to Siberia, but is usually very localised. In Britain, 19th century records were made widely in England and once in Wales. The beetle appears to have declined in the first half of the 20th century, probably because of loss of habitat to forestry or development, but this is not known for certain. It is currently known only at two British localities; Luccombe Chine on the Isle of Wight and Birk Crag, near Harrogate in Yorkshire.

Harrogate Borough Council has been managing the site at Birk Crag with the click beetle in mind but recent surveys in the area have failed to find it, perhaps because of bad weather.

RESEARCH NOTES

Organic farming: of limited benefit to wildlife?

A group at the University of Leeds, northern England, has compared organic and conventional farming with regard to the biodiversity of birds, insects (including butterflies, bees and hoverflies), earthworms and plants. Led by Prof. Tim Benton and funded by the Rural Economy Land Use programme, the group made a paired comparison of thirty-two organic and conventional farms within two areas of central South-west England and the North Midlands. They took account of more than 30 variables, covering climate, topography, socio-economic conditions, land use and soil type. There were also comparisons between individual fields, with 192 fields sampled in total.

Prof. Benton's group suspected that, in earlier attempts to assess the effects of organic versus conventional farming on biodiversity, there had been a failure to distinguish between the benefits of two different things: (1) organic farming *per se* and (2) the relatively high landscape diversity of areas where organic farms are concentrated. The new study was therefore designed to exclude the structural effects of landscape. On this basis, and using an overall scale of biodiversity, the group found that the organic farms provided a benefit of 12.4%. The agricultural yield of these farms was, however, only 55% of that of their conventional counterparts.

The group's overall comparisons are underlain by particular relationships. For example, there might be more plant species in an organically managed field than in a field where herbicides are used, but there will not necessarily be a correspondingly greater diversity of pollinating insects. A benefit for insects can, however, be detected by aggregating the data across a wider area of organic and conventional farms. Equally, however, there was evidence of unforeseen negative impacts. For example, in areas containing a concentration of organic farms, the remaining conventional farms tend to use above-average amounts of herbicides in order to counteract the influx of weed seeds coming from their more weed-tolerant neighbours. Another apparently 'negative effect' was caused by a tendency for organic farms to attract birds such as magpies and jays, which preyed on smaller birds and thus reduced their numbers.

Prof. Benton concedes that organic methods may be a useful part of the land management mix for the less productive parts of the UK, particularly if policies can encourage farmers to co-ordinate activities to maximise the benefit to wildlife across a larger area. On balance,

however, he concludes rather controversially that the evident inability of organic farming to feed the growing human population of the UK outweighs the apparently small biodiversity benefits that the study has identified.

Reference

http://www.fbs.leeds.ac.uk/research/bulletin/index_2010.php?id=1094

Grassland restoration

The AES book "*Habitat Conservation for Insects*" (1991) includes a section by Terry Wells on the re-creation of grassland habitats. He suggested two main methods: (1) establishment by sowing native-sourced wildflower seed mixtures into seed drills cut into a herbicide-killed area and (2) establishment of forbs in existing turf by slot-sowing into herbicide-killed patches or by inserting pot-grown plants. He also described a variant of slot-sowing, whereby the seed is sown into rotovated strips without the use of herbicides.

Slightly different methods have recently been evaluated in a desk-study of various projects, as summarised in Science for Environment Policy, DG Environment News Alert Service, Issue 205, 22-Jul-2010.

Sowing with seed mixtures was most effective when undertaken in the manner advocated in the AES book; i.e. by first removing strips or patches of the existing vegetation to produce a seed-bed. Removal of vegetation generally doubled the probability of long-term survival of the introduced wildflowers, irrespective of the method of introducing the seed. In some studies, the method involved the transfer of hay, chaff or rakings derived from herb-rich swards. Where the vegetation was not stripped, the long-term survival was as low as 32%. When topsoil, in addition to existing vegetation, was stripped, the resulting reduction in the concentration of nutrients helped to prevent competition from rank grasses.

Another method, which has some similarities to the slot-seeding advocated in the AES book, is to transfer turf and seed-rich soil to the site. In most of the studies analysed, the pieces of turf were large (more than 0.5 m by 0.5 m) and laid over the whole area. When the turfs were included together with soil, the rate of success was generally higher than when soil was transferred alone, except on wet sites.

Ed: Another, sometimes successful, method is the inversion of blocks of soil, thereby exposing long-dormant seeds in the natural seedbank, while also burying the existing vegetation.

Mirid bug outbreak in GM cotton crops

Resistance to insect pests has been introduced into various crop species by the addition of the Bt gene, derived from the entomopathogenic bacterium *Bacillus thuringiensis*. Although the built-in resistance of genetically modified (GM) varieties can reduce the need for pesticides, there is cause for concern that the Bt gene could be transferred, via pollen, to related wild plants, which are essential for the survival of non-target invertebrates. Also, there has been some concern that GM pollen could be directly harmful to non-target invertebrates that feed on it or that inadvertently ingest it when it has been deposited on their foodplants.

A study in China has revealed that a different kind of problem can arise from the use of Bt-modified crops; i.e. the emergence of new pest species. The study concerned the occurrence of mirid bugs in Bt-cotton, which has been widely grown in China since 1997 in order to control the pest moth, cotton bollworm *Helicoverpa armigera*. The study involved monitoring populations of the bugs from 1997 to 2008, together with the use of insecticides on cotton from 1992 to 2008, at 38 sites in six major cotton-growing provinces of northern China. Cotton is grown there by more than 10 million small-scale farmers, over an area of 3 million hectares. They also grow 26 million hectares of other crops.

During the study period, farmers gradually switched from conventional to Bt cotton and consequently sprayed less insecticide to control the cotton bollworm (Lu *et al.*, 2010). Unlike the bollworm larvae, which die as a result of ingesting plant tissues containing the Bt toxin, sucking insects such as mirid bugs can thrive on Bt cotton. Since cotton is a preferred host for oviposition by mirids relatively early in the season, their numbers can rapidly increase in the absence of the broad-spectrum insecticides that were previously used to control the bollworm on non-Bt cotton. They then spread to other crops, such as Chinese dates, grapes, apples, peaches and pears. The bugs, which were formerly of little importance, have therefore acquired new pest status as an unintended consequence of genetic modification. The research group has suggested that, in order to help prevent the creation of further problems, the long-term ecological impacts of GM crops at landscape-level should be urgently assessed.

Reference

Lu, Y., Wu, K., Jiang, Y. *et al.* (2010). Mirid bug outbreaks in multiple crops correlated with wide-scale adoption of Bt Cotton in China. *Science*. DOI: 10.1126/science.1187881. (cited in Science for Environment Policy, DG Environment News Alert Service, Issue 203, 09-Jul-2010)

Inbreeding in bumblebees

Professor Dave Goulson's group at Stirling University, Scotland, has announced evidence of a negative association between disease-resistance and a lack of genetic diversity in bumblebee populations. The evidence comes from a PhD project by Penelope Whitehorn, who studied colonies of the severely declining Moss carder bee *Bombus muscorum* on nine Hebridean islands by assessing the level of infection by gut-inhabiting parasites. In particular, she found that the island populations are carrying a higher load of the parasite *Crithidia bombi* than mainland populations. Her findings seem consistent with the opinion, long held among population biologists, that inbreeding can render small populations particularly vulnerable to adverse factors.

Isolation is regarded as one of the main issues to be addressed in invertebrate conservation, since there are many species that do not disperse very far and that are therefore unlikely to re-colonise sites following chance local extinction. A lack of gene flow is an added problem if it increases the probability of such extinctions. It is nevertheless possible for isolated populations to survive indefinitely if conditions remain suitable, perhaps with the help of human intervention in the case of 'charismatic' species that can receive special attention.

The Hebridean findings seem to confirm that inbreeding is a factor to be taken into account in conservation programmes. They do not, however, necessarily indicate that inbreeding is responsible for the decline of bumblebees in Britain, of which two have become extinct in the last 70 years, while a further six of the remaining 24 have become endangered. A straightforward loss of habitat as a result of intensive farming and the destruction of wildflowers by herbicide use could be largely responsible. As mentioned in the last issue of *ICN*, Buglife – The Invertebrate Conservation Trust has proposed the creation of a network flower-rich corridors in Britain, in order to help reverse this loss. Similarly, Prof. Goulson has suggested that 'green corridors' should be planted through towns and that people should be encouraged to grow 'bee-friendly plants' in gardens, parks and on road verges.

The work of the Bumblebee Conservation Trust, which is based at Prof. Goulson's department in Stirling, has recently been voted the UK's Best Environment Project at The National Lottery Awards 2010.

Letter to the Editor

from Ray Softly, Ashingdon Hall, Church Road, Ashingdon, Rochford, Essex SS4 3HZ

I write having been provoked by the editorial in *ICN*. My own view about human population is that we have passed the disaster point – the earth's carrying capacity for a technological population. H.G. Wells, writing "*The Shape of Things to Come*" just prior to WW2, envisaged the future population as being held to a "comfortable" 4 billion. He gives no reason for this figure. I am aware that the number I joined in 1915 was 1.7 billion and that there has been a 300% increase since then. Edward O. Wilson, the American naturalist, wrote (in "*The Future of Life*") of a "bottleneck", referring to the predicted stabilisation of the population at nine or ten billion. This is a totally misleading metaphor. It is in fact a tunnel – of indefinite length, unless the population is reduced drastically either in a planned or a cataclysmic manner.

Today's politicians are incapable of thinking even a century ahead, covering the life expectancy of those being born today. Marx wrote of "whole continents cleared for agriculture" as the result of the progressive phase of capitalism. He did not think in terms of whole ecosystems being destroyed. We are going ahead with the concept of nature reserves within a matrix of human infrastructure, but the only safe (and probably impossible) concept is of pockets of technological civilisation within a matrix of undisturbed nature.

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